Heavy Metal Pollution Levels in Borehole Water Obtained from Ukpa in Ohaisu Community Afikpo North Lga, Ebonyi State.

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Abstract- ***This study was carried out to obtain the heavy metal contamination levels in borehole water from Ukpa under Ohaisu community in Afikpo North L.G.A. water samples collected from five borehole water sources Izakani (sample A). Ezieti (sample B), Amachara (sample C), Civic centre (sample D) and Gov. college (sample E) were analyzed to identify the concentration of Cadmium (Cd), Lead (Pb), Nickel (Ni) Chromium (Cr) and Zinc (Zn) using Atomic Absorption spectrophotometer (AAS) standard method. The standard method approved by the World health organization was used to collect the samples. The result showed that the concentration level of Borehole water from; Izakani, Ezieti, Civic centre and Gov. college were above the maximum permissible limit of WHO contaminant level. Sample C (Amachara) was the only borehole water within the standard range of WHO contaminant level. Sample B (Ezieti), recorded the highest concentration level of lead having 0.06mg/L above WHO maximum level of 0.03 mg/L, other samples were free from lead. Based on the metals analyzed, it was concluded that the borehole water sources from Izakani, Ezieti, Civic centre and Gov. college are unsafe for drinking. While Borehole water from Amachara is safe for drinking and poses no health risks to the residence of the area. It is therefore recommended that Amachara borehole water should be cared for by the natives who use it as their drinking water supply, while this study should be preserved as baseline for future water analysis.***

Indexed Terms- ***heavy metals analysis, under groundwater, water pollution***

I. INTRODUCTION

Due to the numerous health risks associated with drinking water contamination, it has become very crucial to determine the quality of drinking water from domestic and commercial borehole sources to ascertain the level of contamination of the water from chemical, physical and biological contaminations. The parameters have been found to often be present in amounts harmful to the human health (1). Heavy metals in drinking water at low or small concentrations are toxic to human health and become more damaging when accumulated (2). Lead (Pb), cadmium (Cd), chromium (Cr), zinc (Zn), nickel (Ni) etc. are very poisonous at low concentrations. Exposure to these metals poses serious risks and health concerns. Some of the effects include kidney failure, death, blindness and cancer.3,4,5,6

Water supply systems and drinking water inaccessibility in rural areas are of global concern that calls for immediate attention. About 884 million people in the World still do not get their drinking water from approved sources. Providing quality drinking water to all citizens who are deprived of access to

water will serve as the breaking point of poverty alleviation in most rural areas. Having reliable drinking water is now recognized by United Nations as a human right.

The term "heavy metals" refers to any metallic element that has a relatively high density and is toxic even at low concentration (7). Heavy metal is a general collective term which applies to the group of metals and metalloids with atomic density greater than 4g/cm^3 or 5 times or more greater than the density of water (8,9,10). Water heavy metal pollution is contamination of water by heavy metals that deteriorates the quality of the water. It involves the release of toxic substances that require much oxygen to decompose, radioactive substance, into water bodies that becomes deposited upon the bottom and their accumulations will interfere with the condition of aquatic ecosystems.

Thirty-five metals pose a threat to human health 23 of which are heavy metal (11). Studies report various effects of heavy metals in drinking water (12). According to the International Agency for Research on Cancer (LARC) inorganic Arsenic and cadmium are classified as human carcinogens. Other effects such as heart diseases and blood cholesterol from Antimony, Anemia and liver damage from mercury, and gastrointestinal disorder from copper are also reported (12)

II. MATERIALS AND METHIOD

- STUDY AREA

Ukpa is one of the twenty-two communities in Afikpo North L.G.A. of Ebonyi Afikpo is situated in the southern part of Ebonyi State, Nigeria and spans an area approximately 164 square kilometers in size. It is located on the latitude of 5 53 29°N and longitude of 7 56 7.22 E of the equator. The people of Ukpa are predominately farmers and handcrafters with yam, rice, cassava, vegetable as their nm crops of interest.
The area is characterized with hard rocks, the rocky nature of the region makes exposed to abundant rainfall and hot temperature conditions during the rainy season. The geographical region of Ukpa people are among between igbo speaking communities of Ebonyi State but still have Afikpo dialect as their unique language. is characterized with defined swampy area.

- SAMPLE COLLECTION AND PREPA RATION

Borehole water samples were randomly collected from five (5) different boreholes Ukpa Community ((lzakaniu, Ezieti, Amadara civic centre, Gov. College) in 1 litre stic containers with screw caps in the month of September 2017 the sterilized plastic Containers were washed thoroughly in the laboratory using detergent and rinsed with the containers were and rinsed with the water sample at the points of collection.
The samples were collected by first allowing the water to run for about 3minutes before allowing it into container for tap month. Exactly 8ml of concentrated trioxonitrate

- ANALYTICAL PROCEDURE

Exactly 10% HNO3 was added to lml of the water sample that as collected, it was shaken to ensure a uniform mixture and then made up to 100ml mark. The cathode lamp for each ot the element was put in position in the spectrometer and the element wavelength was selected using the instrument wavelength selector. The working standard solution of AAS for each metal were prepared by dilution from the T00ppm stock solution for Cadmium, Chromium, Lead, Nickel and Zinc. First, the sample solution was aspirated by a Pneumatic nebulizer, transforming it into an aerosol which was introduced into the flame gases and conditioned in a way that only the finest aerosol droplet enters the flame. On top of the spray chambers, a burner head produced a flame that is laterally long (usually 5-10cm) and a few millimeter deep. The radiation beam passes through this flame at 1S IOn8est axiS, and flame gas flow rate was adjusted to produce the highest concentration to the free atoms of the elements. The burner height was adjusted so at the radiation beam passes through the zone of the highest atom cloud density in the flame resulting in the highest density. The concentration in the sample solutions aspirated was recorded.

- SUMMARY OF CONCENTRATED OF METAL IN SAMPLE AND THEIR CORRESPONDING WHO STANDARD PERMISSIBLE LIMITS

SUMMARY	SAMPLE A	SAMPLE B	SAMPLE C	SAMPLE D	SAMPLE E	W.H.O
	Izakani	Ezieti	Amachara	Civic center	Gov, college	
Cadmium (PPM)	0.015	0.00	0.016	0.013	0.015	0.030
Chromium (PPM)	0.018	0.011	0.004	0.017	0.018	0.050
Lead (PPM)	0.012	0.006	0.018	0.00	0.00	0.010
Nickel (PPM)	0.000	0.061	0.00	0.00	0.012	0.020
Zinc (PPM)	5.958	0.00	0,00	5.979	5.958	4.000

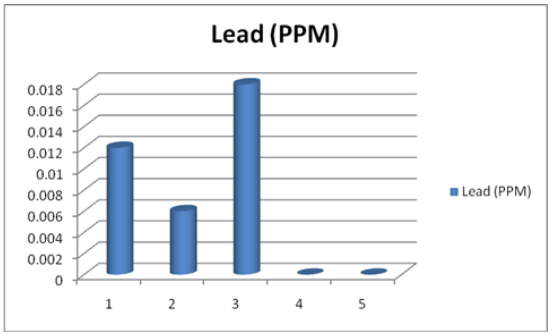

Fig 1: showing the level of lead pollution in the lead polluted borehole water

III. DISCUSSION, CONCLUSION AND RECOMMENDATION

- DISCUSSION

Table1 shows the sampling locations , sites and shows the concentration of metals in sample A (Izakani). Cadium and chromium was found to be within the W.H.O permissible limit having the values of 0.007 and 0.013 respectively.Lead was absent in sample A but Nickel and Zinc was found to be above WHO standard. Nickel recorded 0.060mg/l against 0.020 mg/l standard of WHO. Zinc has 0.589ml/l against 4.00mg/ of WHO. The concentration of metal in sample B (Ezieti). Cadmium and Zinc were absent in sample B. Lead recorded 0.061 mg/l which is above WHO permissible limit of 0.010mg/1. Nickel and Chromium are with the maximum permissible limit of WH0. The concentration of metal in sample C (Amachara). Cadmium, Chromium and Nickel recorded concentrations of 0.016, 0.004 0.018 respectively which falls within the standard permissible limit of WHO Lead and Zinc were found to be absent in sample C (Amachara). The concentration of metal in sample D (Civic centre). Lead and Nickel were found to be absent in sample D. cadmium concentration was 0.013mg/l which is within WHO standard. Chromium and Zinc was above the standard permissible limit of WHO. They had 0.071mg/l and 5.979mg/l respectively, compared to WHO standard which is 0.050mg/l and 4.00mg/l respectively. The table also shows the concentration of metals in sample E (Gov. college). Cadmium and lead having the concentrations of 0.015mgL/, 0.010mg/L, and 0.012mg/L Chromium and Respectively were found to be within the permissible limit of WHO. Nickel was found to the permissible limit of WHO. Nickel was found to be in sample E. Zinc having 5.958m as against 4.00mg/L of WHO standard, therefore there is high concentration level of zinc in sample E (Gov. college).

Table 1 also shows the Summary of concentration of metals in the sample sand their\ corresponding WHO permissible limits

- CONCLUSION

The result from the above analysis shows that sample A (Izakani) recorded the highest concentration level of Nickel having 0.060mg/l. Sample B recorded the highest concentration level of lead, having 0.061 mg/L. Sample D (Civic centre) recorded the highest concentration level of Chromium having\ 0.071mg/l others are within the WHO range and some showed non-detectable presence of the 5 (five) metals. Samples A, B and D are unsafe for drinking without any prior treatment, therefore continuous analysis need to be carried out on these borehole waters.

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